

Effect of Micronutrient Seed Treatment on Growth and Yield of Groundnut*

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ABSTRACT Investigation to find out the effect of B, Zn and Mo seed treatment on the growth and yield of groundnut (cv. KRG-1) was conducted at Agriculture College Farm, Raichur. Field experiment was carried out with 18 treatments and replicated thrice in Alfisol, which was deficient in zinc (0.46 mg kg⁻¹) and Mo (0.032 mg kg⁻¹). Application of micronutrients (B, Zn and Mo) showed significant increase in yield, oil content and growth parameters. Among the different treatments seed treatment with Zn @ 4 g kg⁻¹ + Mo @ 2 g kg⁻¹ seed recorded maximum yield (24.99 q ha⁻¹) and growth parameter (number of nodules, its dry weight, root length and its dry weight) over control. The extent of increase was 24.11 per cent over control. Oil content in control was 45.64 per cent which increased significantly to a maximum of 46.84 per cent due to seed treatment with Zn @ 4 g kg⁻¹ + Mo @ 2 g kg⁻¹.

Keywords: Micronutrient, boron, zinc, molybdenum, seed treatment, groundnut

Groundnut (*Arachis hypogaea* L.) is an important oilseed crop in India and accounts for 45 per cent of the area and 55 per cent of the total oilseeds production in the country. However, average productivity is very low (8 to 10 q ha⁻¹) compared to China and USA (30 q ha⁻¹) [1]. In Karnataka, it covers an area of 1.11 m ha with a production of 0.75 m t [2]. The reasons for such a low yield have been ascribed to several constraints, including micronutrient deficiency. Though the micronutrients are required in small amount, they may be harmful when added to the soil in high amounts, there is a small 'window' of concentration of these elements where plant growth is optimal. Among the micronutrients, deficiency of zinc is quite wide spread followed by iron. The analysis of 1.94 lakh soil samples collected from all over the country indicated that about 43 per cent and 25 per cent of the soil samples are deficient in zinc in India and Karnataka respectively [3]. Though the deficiency of boron and molybdenum in soils of India is uncommon, many researchers showed that oilseed crops respond positively to boron and molybdenum

application as their nutrients. Micronutrient carriers have higher efficiency when they are supplied through seed treatment, as their requirement is very less thereby leaving less scope for losses especially fixation. Thus, it is better to supplement through the seed treatment rather than soil application. In view of the above facts, the present investigation was undertaken to study the effect of seed treatment of B, Zn and Mo on groundnut (cv. KRG-1).

MATERIALS AND METHODS

A field experiment was conducted in the Agriculture College Farm, Raichur during *khari* 2003 in an Alfisol with a pH 7.92, EC of 0.27 dS m⁻¹ and with content of 0.67 per cent O.C [4], 288.00 N kg ha⁻¹ [5] 29.25 P₂O₅ kg ha⁻¹ [4], 269.00 K₂O kg ha⁻¹ [4], DTPA- extractable zinc 0.46 mg kg⁻¹ [6], hot water soluble B 0.50 mg kg⁻¹ [7] and available molybdenum of 0.032 mg kg⁻¹ [8].

The field experiment was conducted with the 18 treatments; in a RBD design having gross plot of

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Table 1. Root length and its dry weight, total and effective nodules and their dry weight on 50 DAS as influenced by B, Zn and Mo seed treatment in groundnut

Treatment dose (kg seed)	Root length (cm)	Root dry weight (mg)	Total nodules		Effective nodules	
			Number/ plant	Dry weight (mg/plant)	Number/ plant	Dry weight (mg/plant)
T ₁ - Control	9.73	623	46.4	48.4	21.33	27
T ₂ -B (1g)	9.33	630	46.2	64.8	21.66	42
T ₃ -Zn (2g)	9.67	653	48.4	68.4	22.96	50
T ₄ -Zn (4g)	9.99	712	49.4	84.2	23.22	50
T ₅ -Mo (2g)	9.67	670	48.6	88.6	22.04	55
T ₆ -Mo (4g)	9.65	637	49.8	88.4	23.33	55
T ₇ -B(1g) + Mo (2g)	10.22	753	51.4	88.6	23.70	55
T ₈ -B(1g) + Mo (4g)	10.67	721	53.8	95.9	24.39	64
T ₉ -B(1g) + Zn (2g)	11.33	757	55.4	92.4	24.98	60
T ₁₀ -B(1g) + Zn (4g)	11.87	797	55.8	92.4	25.49	65
T ₁₁ -Zn(2g)+Mo (2g)	12.66	803	53.8	94.2	25.50	68
T ₁₂ -Zn(2g)+Mo (4g)	12.60	833	54.4	98.4	27.56	66
T ₁₃ -Zn(4g) + Mo (2g)	13.66	887	57.4	100.2	27.80	70
T ₁₄ -Zn(4g) + Mo (4g)	13.50	837	55.8	98.4	26.80	65
T ₁₅ -B(1g)+Zn(2g) + Mo (2g)	13.10	777	53.4	96.4	25.60	65
T ₁₆ -B(1g)+Zn(2g)+Mo (4g)	13.00	833	43.8	98.0	26.60	70
T ₁₇ -B(1g)+Zn(4g) + Mo (2g)	13.44	833	45.0	100.0	25.80	65
T ₁₈ -B(1g)+Zn(4g) + Mo (4g)	13.36	797	45.4	97.2	25.49	70
S.Em±	0.369	44	1.48	2.67	0.80	1.81
CD (0.05)	1.059	124	4.26	7.66	2.31	5.19

Recommended dose of fertilizer is common for all the treatments.

5.0m × 3.3m and net plot of 4.8m × 2.7m with three replications. The micronutrients like B, Zn and Mo were supplied through sodium tetra borate, zinc sulphate and ammonium molybdate, respectively.

At the time of sowing, nitrogen in the form of urea, phosphorus as DAP and potassium as MOP were applied at the recommended dosage (25:50:25 N: P₂O₅:K₂O kg ha⁻¹) to soil. Before sowing, seeds were treated with micronutrients as per treatment details using Jaggery (0.25 %) as adhesive. The crop was raised by following recommended package of practices. Observations were taken on root and modulation by watering and uprooting carefully with intact root system at 50 DAS. Roots were washed to remove the adhering soil, number of nodules and root length of the five randomly selected plants from each plot were recorded. Observation on growth parameters like plant height, number of leaves and branches were also recorded at 50 DAS.

Then root portion and nodules were dried at 65±1°C in the oven and the weight was recorded. The kernel oil content was recorded using a nuclear magnetic resonance (NMR).

RESULTS AND DISCUSSION

The data from the field experiment indicated that the root length, root dry weight and nodulation in groundnut were significantly influenced by seed treatment (Table 1).

At 50 DAS, root length and root dry weight in the treatment receiving Zn @ 4 g kg⁻¹ + Mo @ 2 g kg⁻¹ (T₁₃) in combination was superior to other treatments. But on par with combinations of Zn + Mo (T₁₁, T₁₂ and T₁₄) and B + Zn + Mo (T₁₅, T₁₆, T₁₇ and T₁₈). The treatment with Zn @ 4 g kg⁻¹ + Mo @ 2 g kg⁻¹ gave the highest root length (13.66 cm) and dry weight (887 mg). Whereas in control, root length

Table 2. Pod yield (q ha⁻¹), shelling percentage, 100-seed weight (g), oil content (%) and oil yield (q ha⁻¹) as influenced by B, Zn and Mo seed treatment in groundnut.

Treatment dose (/kg seed)	Pod yield (qha ⁻¹)	Shelling (%)	100 seed weight (g)	Oil Content (%)	Oil yield (qha ⁻¹)
T ₁ - Control	19.66	62.14	34.00	44.94	558.24
T ₂ -B (1g)	20.16	64.49	34.56	45.25	579.28
T ₃ -Zn (2g)	21.97	64.58	36.00	45.32	633.05
T ₄ -Zn (4g)	22.07	65.58	36.68	45.94	650.31
T ₅ -Mo (2g)	21.60	63.59	36.56	45.20	620.94
T ₆ -Mo (4g)	21.98	64.43	36.36	45.45	643.75
T ₇ -B(1g) + Mo (2g)	22.34	65.14	37.64	45.79	676.78
T ₈ -B(1g) + Mo (4g)	22.39	65.51	37.24	45.68	690.68
T ₉ -B(1g) + Zn (2g)	22.77	67.92	37.21	45.92	710.27
T ₁₀ -B(1g) + Zn (4g)	23.32	68.31	37.81	46.12	734.58
T ₁₁ -Zn(2g) + Mo (2g)	23.55	70.51	38.86	46.96	779.00
T ₁₂ -Zn(2g) + Mo (4g)	22.44	68.54	38.46	46.28	711.70
T ₁₃ -Zn(4g) + Mo (2g)	24.99	72.12	39.54	47.84	862.32
T ₁₄ -Zn(4g) + Mo (4g)	23.14	69.49	38.36	47.13	757.85
T ₁₅ -B(1g)+Zn(2g) + Mo (2g)	23.74	68.16	38.00	47.22	764.08
T ₁₆ -B(1g)+Zn(2g) + Mo (4g)	23.60	71.00	38.32	47.58	797.25
T ₁₇ -B(1g)+Zn(4g) + Mo (2g)	24.74	71.43	39.00	47.73	843.47
T ₁₈ -B(1g)+Zn(4g) + Mo (4g)	23.62	69.14	38.46	46.32	756.45
S.Em±	0.89	2.086	0.943	0.576	1.346
CD (0.05)	2.56	5.990	2.910	1.656	3.869

Recommended dose of fertilizer is common for all the treatments.

and dry weight were 9.73cm and 623mg, respectively. This increase in root growth might be due to beneficial effect of Zn and Mo. Similar findings were reported earlier also [9 and 10].

At 50 DAS, maximum total number of nodules and their dry weight and number of effective nodules and their dry weight (57.40 and 100.20 mg plant⁻¹ and 28.80 and 70 mg plant⁻¹, respectively) were recorded by Zn 4 g + Mo 2 g. Increase in nodules in this combination might be due to optimal levels of zinc and molybdenum both of which are involved in improvement of nodulation. Similar results were reported earlier also [10, 11, 12 and 13].

Pod yield in control was 19.66 q ha⁻¹ which increased with application of B, Zn and Mo significantly (Table 2). Thus the maximum pod yield of 24.99 q ha⁻¹ was obtained with the seed treatment of Zn @ 4 g kg⁻¹ + Mo @ 2 g kg⁻¹ in combinations.

The extent of increase in yield over control (T₁) was 27.11 per cent. The increase in pod yield of groundnut as a result of Zn and Mo seed treatment might be attributed to better 100-kernel weight (39.54 g), shelling percentage (72.12 %), root growth and nodulation (Table 1). These findings are in agreement with those reported by earlier workers [10, 11, 14, 15 and 16]. The increase in growth and yield parameter might be attributed to complementary effect of Zn and Mo. Being essential for N - fixation, Mo has ensured better nutrient supply to the crop, zinc being involved in the activation of several enzymes system might have improved the crop growth and yield.

Oil content and oil yield was significantly higher in the treatment receiving Zn @ 4gkg⁻¹ + Mo@2g kg⁻¹(46.84 % and 844.30 kg ha⁻¹) over control (45.14 % and 560.00 kg ha⁻¹). The per cent increase in oil

content and oil yield in T₁₃ over control was 3.77 and 50.76 per cent, respectively. The significant increase in kernel oil content and oil yield might be due to the fact that zinc plays an important role in NADPH synthesis, which is related to fat synthesis [14]. From the present investigation it was clear that seed treatment of Zn @ 4 g kg⁻¹ + Mo @ 2 g kg⁻¹ seed was helpful in significant increase in pod yield and oil content in groundnut.

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